

WHAT IS CLAIMED IS:

1 1. A method for adjusting the resonant frequency of an acoustic resonator
2 comprising the steps of:

3 identifying an electrode-piezoelectric stack having an off-target
4 resonant frequency, said electrode-piezoelectric stack having conductive
5 electrode layers; and

6 oxidizing at least one of said conductive electrode layers of said
7 electrode-piezoelectric stack so as to achieve a target resonant frequency
8 that is dissimilar from said off-target resonant frequency, including intention-
9 ally inducing oxidation by exposing said at least one conductive electrode
10 layer to an oxidizing environment.

1 2. The method of claim 1 wherein said step of oxidizing includes thermally
2 oxidizing said at least one conductive electrode layer of said electrode-
3 piezoelectric stack by exposing said electrode-piezoelectric stack to an
4 oxidation-inducing environment at an elevated temperature.

1 3. The method of claim 2 wherein said step of thermally oxidizing includes
2 exposing a top electrode layer of said conductive electrode layers to said
3 oxidation-inducing environment at said elevated temperature.

1 4. The method of claim 3 wherein said step of thermally oxidizing includes
2 exposing a top surface of said top electrode layer to said oxidation-inducing
3 environment at said elevated temperature, said oxidizing being limited to a top
4 region of said top electrode.

1 5. The method of claim 1 wherein said step of oxidizing includes providing
2 said oxidizing environment as air.

1 6. The method of claim 1 wherein said step of oxidizing includes forming
2 said oxidizing environment within a rapid thermal annealer (RTA).

1 7. The method of claim 1 further comprising a step of fabricating said
2 electrode-piezoelectric stack to be suspended over a cavity.

1 8. The method of claim 1 further comprising a step of fabricating said
2 electrode-piezoelectric stack over a Bragg reflector.

1 9. A method for stabilizing a resonant frequency of a film bulk acoustic
2 resonator (FBAR) comprising the steps of:
3 providing a substrate;
4 forming a bottom electrode above said substrate;
5 forming a piezoelectric layer above said bottom electrode;
6 forming a top electrode above said piezoelectric layer, said top
7 and bottom electrodes and said piezoelectric layer being said FBAR; and
8 intentionally inducing oxidization of an upper portion of said top
9 electrode by exposing said FBAR to an oxidation-inducing environment.

1 10. The method of claim 9 wherein said step of intentionally inducing
2 oxidation includes providing thermal oxidation at an elevated temperature
3 that is higher than an ambient temperature.

1 11. The method of claim 10 wherein said step of providing thermal oxida-
2 tion includes establishing a temperature that is significantly above room
3 temperature.

1 12. The method of claim 10 wherein said step of providing thermal
2 oxidation includes elevating the temperature adjacent to said top electrode
3 to 215 degrees Celsius.

1 13. The method of claim 9 wherein said step of intentionally inducing
2 oxidization includes exposing said upper portion of said top electrode to air.

1 14. The method of claim 9 wherein said step of intentionally inducing
2 oxidation includes exposing said upper portion of said top electrode within a
3 rapid thermal annealer (RTA).

1 15. A film bulk acoustic resonator (FBAR) comprising:
2 a substrate;
3 a bottom electrode above said substrate;
4 a piezoelectric layer above said bottom electrode; and
5 a top electrode having an upper region above said piezoelectric
6 layer, said upper region including metal oxide, at least a portion of said metal
7 oxide being realized by an elevated temperature that is higher than the
8 ambient temperature;
9 wherein said FBAR having said portion of metal oxide has a
10 resonant frequency that is substantially closer to a target resonant frequency
11 than said FBAR without said portion of metal oxide.

1 16. The FBAR of claim 15 wherein said top electrode has a thickness that
2 is greater than a comparable electrode without said portion of metal oxide
3 being realized by said elevated temperature that is higher than said ambient
4 temperature.

1 17. The FBAR of claim 15 wherein said ambient temperature is room
2 temperature.

1 18. The FBAR of claim 15 wherein said top and bottom electrodes and
2 said piezoelectric layer form an element of an FBAR array.

1 19. The FBAR of claim 15 wherein said top and bottom electrodes and
2 said piezoelectric layer form an element of a passband filter.

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- 1 20. The FBAR of claim 19 wherein said resonant frequency is compatible
- 2 with operation in a code division multiple access (CDMA) personal communi-
- 3 cation system (PCS).

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